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Washington, D.C. 20554

In the Matter of	)	
	)	GN Docket No. 09-51
A National Broadband Plan for Our Future	)	

COMMENTS OF MICROSOFT CORPORATION
June 8, 2009

Executive Summary

The Commission's National Broadband Plan should put the country on a course to achieve what is now globally recognized as a 21st century imperative: *citizens should have ubiquitous access to robust, affordable and constantly improving broadband connectivity, so they can benefit from the evolving diversity of Internet applications and services, and so they can fully engage with the global economy*. Broadband access is essential to commerce, communication, entertainment, education, worker training, healthcare, energy optimization and much more. Pervasive broadband is crucial to America's global competitiveness. Adequate access to broadband is necessary for everyone to realize their full potential.

Convergence in communications, long talked about, is rapidly occurring and in multiple dimensions. Modes of communication such as voice, instant messaging, video and texting are being unified in seamless ways. They are also increasingly delivered using common signaling and control protocols over packet-based networks, not via siloed networks. Consumers expect to use these services uniformly across mobile and wireline systems. Moreover, the modes of communication themselves are not isolated, but are being embedded in other applications and services, and delivered via an Internet "cloud." Examples include social networking with email, online gaming with VoIP and portal services that support many communications tools. In short, there is rapid evolution across the services and applications layers atop a relatively stable foundation of Web and Internet protocols, and IP networks.

The trend is accelerating. Consumers increasingly expect to access their applications and interactive services across multiple devices and screens: (i) PCs and laptops; (ii) powerful mobile phones; (iii) smart TVs; and (iv) a range of novel Internet-connected devices. Voice and video applications operate across device boundaries. TV sets and set-top-boxes are starting to include computing and Internet capability. New devices (e.g., Amazon's Kindle, GPS-driven navigation systems) seem to appear on the scene monthly. Convergence is creating a "4-screen, plus cloud" infrastructure that allows consumers to enjoy myriad Internet applications and services irrespective of where they are, what devices they are using and what network a device is on. This convergence requires us to rethink policy and put it in the context of our new reality – to go beyond the traditional siloed contexts.

We see four strategies the FCC should include in its Plan to move the nation towards ubiquitous, affordable, ever-improving broadband – and the applications and services that rely on that connectivity:

- **Define Baseline Broadband Services.** Create definitions of "baseline broadband" for households and anchor-institutions in a way that meets citizens' critical needs today and as those needs evolve.

- For households, the definition should support the applications and services citizens need to participate effectively in e-society. Today, the right combination would be 4 Mbps downstream, 1 to 2 Mbps upstream and the ability to consume 50 Gigabytes per month.
- Anchor institutions, such as K-12 schools, higher education, libraries, hospitals and other key community hubs, should receive a higher level of Baseline service. We recommend a general benchmark of 100 Mbps (to be adjusted for the size of the institution), and preferably symmetrical, to encourage deployment of future-proof technology like fiber. Investing in equipment that scales upward with technological advances is highly preferred.
- The FCC should adopt rules that encourage the use of subsidized anchor-connections as jumping off points for network providers to economically deliver consumer last-mile service.
- The household and anchor-institution definitions of Baseline Broadband should be updated periodically as applications, services and expectations drive demand for greater capability.

- **Reform Subsidies**. The many programs that subsidize connectivity should be refocused, updating them from telephony-centric to include support for Baseline service for unserved and underserved.
  - In place of the existing, complicated subsidy-collection mechanisms, the Commission should create a greatly simplified, nationwide system. As seen with VoIP, the convergence of once stand-alone functions, coupled with emerging communications tools and mash-up services, creates intractable definitional and, thus, taxation problems. To avoid these issues, we suggest that charges be assessed based on physical broadband connections and the level of bandwidth consumed. Higher-layer applications and services should not be taxed given their rapid innovation and their ever-changing nature.
  - To stimulate competition in underserved areas, the FCC should auction off access to subsidy streams. The FCC can aim to reduce subsidy costs by encouraging interconnection between subsidized anchor-lines and ever-more efficient last-mile technology (e.g., wireless).

- **Ongoing Spectrum Review.** To improve spectrum usage, the Commission should:
  - Assess whether existing allocations are fully utilized and step up efforts, including joint FCC/NTIA efforts, to increase both licensed and unlicensed access to underutilized spectrum. Some of the most significant, recent innovations rely on ready access to unlicensed spectrum (e.g., Wi-Fi).
  - Regularly update rules to encourage efficiency-enhancing breakthroughs, such as software-defined radios and adaptive operations like those approved in the “white spaces” decision.
  - Advance and harmonize these reforms overseas -- enabling a larger marketplace for new products and lowering barriers to bringing such innovations to market.

- **Establish a Convergence-Aware Policy Framework.**
  - Given consumers’ fluid switching among screens and networks, and the rapid diversification of applications and services, we urge the FCC to evolve its regulatory paradigm towards one that is suitably transport-agnostic and that does not undermine innovation.
  - This will be no small challenge. We are moving from a realm of relatively well understood systems to that of *complex, adaptive systems* with nonlinearities, complex feedback loops and unpredictable emergent behaviors. This ever-more complex reality will require a new, agile policymaking framework – a framework that acknowledges that while not all aspects can be "managed" through regulation, one can create policies both that lower the risk of adverse outcomes in the presence of complexity and uncertainty, and that allow officials to act more quickly to address unanticipated adverse phenomena.

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Discussion

I. The 4-screen, plus cloud reality requires a new approach to communications policy

In just this decade, we have witnessed a paradigm shift away from last century's communications marketplace, which had been largely characterized by three separable offers – telephone service, mobile phone service and cable TV. Today, unified-communications products combine in one place features that support not only voice, but also voice mail, video conferencing, instant messaging, email, document storage and online document-collaboration capabilities, as well as video entertainment options. There is no reasonable way to disentangle, say, voice, IM, video, email, storage and social networking applications in the new offers. The intertwining of them is the essence of the innovation. Moreover, in the entertainment market, producers are rapidly moving away from heavy reliance on pre-packaged offers -- such as a fixed programming line-up -- to a variety of new models that support vast on-demand capabilities, as well as time- and place-shifting. To establish even tighter connections with their audiences, they are integrating into their offers interactive capabilities that similarly rely on new two-way video communications, instant messaging (e.g., Twitter) and other media sharing technology. Traditionally siloed communications devices (PCs, smartphones and TVs) are being connected to each other, and the services accessed on these devices are more fluid.

There is a feng shui to how a user interacts with her communications devices and services. By and large, when mobile, she relies on a small screen and keyboard; when stationary, she works on a PC; when relaxing, she is 10 feet from a big screen and is enjoying lightly interactive applications; when in a car, she relies on the navigation and communication system for hands-free operation. Irrespective of the device, however, she does want to access many of the same services as well as her data, pulling that content from the Internet cloud. This 4-screen, plus cloud experience puts the user in control and in the center of her communications environment for the first time. She can choose how and when to make use of the array of communications capabilities available to her.

The nation's regulatory model is not architected to sustain this complex, user-centric, technological and business evolution. The Commission's and Congress's struggles with inter-carrier compensation reform

and the regulation of VoIP – as well as state-level decisions around VoIP-911 charges and VoIP-based taxes -- are emblematic. Adjusting to the change is a global challenge. Microsoft looks forward to working with the Commission and other stakeholders, both within the context of the Plan and beyond, to help create an equitable, forward-looking, robust and yet impactful 21st century policymaking model. Within the context of the Plan, we see four foundational strategies for starting down the path from here to there.

II. The Commission should define "baseline broadband" for households and anchor institutions in a way that meets their distinct needs, and ensure those definitions are updated periodically

As the NOI recognizes, there is no consensus on how to best define broadband. The question of what level is must-have and what level is premium, and at what price, has spawned report after report. Rather than seeking "the" definition, we believe the Commission and other stakeholders will be best served if the agency homes in on a simple definition of Baseline Broadband. We also see value in creating distinct definitions of Baseline Broadband for households and for anchor institutions; basing those definitions on the important functions those entities need in order to be effectively integrated into e-society; placing a priority on rolling out Baseline Broadband to anchor institutions that lack it; and assuring the definitions are updated periodically. Just as policymakers in the past have wanted to assure all Americans have at least basic access to electricity, POTS, highways and broadcast services, the most pressing access question for policymakers today is what basic broadband capability ought to be ubiquitously available at a reasonable price.

The definition of Baseline Broadband should have four components: downstream speed; upstream speed; quality of service; and monthly data-consumption allowances. Today's broadband users should reasonably expect that their connections will support more than narrowband applications like email, Web surfing, search and access to basic online services (like e-government form-filling tools). Consumers increasingly rely on video streaming, cloud-based storage and the movement of ever-larger files (e.g., high-resolution images). In particular, advanced e-health and e-learning services will require support for efficient and high-quality video streaming and two-way capability for interactivity. Sufficient and evolving capability to support these applications will be critical.

a. Residential baseline broadband

In the residential context, we believe the Baseline level should support a range of scenarios that are necessary for effective engagement in e-society. As just one example, we envision a low-income and/or remote household that risks disenfranchisement from e-society unless that family can: (i) make simultaneous use of in-bound video streams (e.g., so the parent can work from home as a remote customer service representative, while a child engages in tele-learning or while another parent takes video-rich online training courses); (ii) engage in at least one-upstream video conversation (for work, education or health purposes); and (iii) enjoy these capabilities on a daily basis without risk of hitting a monthly cap on the amount of data consumed.

In our comments in stimulus-related proceedings, we suggested that for today's purposes such basic broadband functionality for consumers would require 4 Mbps downstream with best-efforts quality-of-service.[1] The upstream speed should be in the range of 1 to 2 Mbps in order to meaningfully support

[1] Many who are concerned about the U.S.'s progress, or lack of progress, in deploying broadband nationwide point to the tremendous success countries like Japan and Korea have had in making residential 100 Mbps service widely

video-conferencing. Any cap on data consumption should be no lower than 50 Gigabytes. An end user regularly utilizing services that heavily rely on video such as distance-learning could easily consume 40 to 60 Gigabytes in taking a month's worth of online classes. It is increasingly common for broadband providers to put a cap on the amount of data a user can download in a month without incurring some restriction or new charge. A 50 Gigabyte benchmark would prevent such caps from impairing basic access at least today. This type of floor will enable, for example, a distance-learning student to enjoy three to four hours of video streaming capability a day.

b. A baseline for anchor institutions

In our earlier comments, we added that there ought to be a higher level of Baseline Broadband capability for key anchor institutions, such as K-12 schools, higher education, libraries, hospitals and emergency care facilities.[2] For anchor institutions, we suggest Baseline broadband benchmarked at 100Mbps, and preferably symmetrical. This is a level that encourages deployment of future-proof (e.g., fiber) connectivity to the institution's network access point. It also is necessary to handle increasingly data-intensive, video-rich, multi-party institutional applications. Schools and libraries serve multiple users simultaneously, whether those users are teachers dispersed across a building or adult-learners aligned along a table of PCs. The benchmark should be adjusted and scaled based on the size of institution. For example, for a 1,000-student school, 100 Mbps allows 10 percent of the students to be concurrently accessing 1 Mbps video streams as they work on an assignment requiring browsing through videos on the Internet. Hospitals and emergency care facilities similarly need significant multi-user capacity to make telemedicine a reality and to access digital images and health records in the cloud. For institutions that serve substantially more people, the benchmark should be higher. In remote, very lightly populated areas the benchmark can be lower.

Given that anchor institutions will enjoy the benefits of subsidized high-capacity, scalable connectivity, we believe it reasonable for the Commission to consider leveraging those user-subsidized pipes to facilitate the rollout of Baseline Broadband to households. If providers of subsidized connectivity to

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available. We do not believe the examples translate well to the U.S. environment, which lacks similar demographics, central control of network operators, etc.

[2] In other comments, Microsoft has laid out our views on how the US government should use stimulus money to accelerate the gap filling. We urge readers to consult those filings, but in summary, we believe the Federal Communications Commission and its companion agencies have an historic opportunity. In the context of the current economic crisis, Congress has asked the FCC, USDA and NTIA to establish a national broadband strategy, and to begin pursuing elements of that strategy by distributing billions of dollars in grants and loans for broadband deployment. Microsoft believes that if the US government were to accomplish just one goal in this process, it should be to ensure that all schools, libraries and hospitals across the nation are connected to future-proof broadband facilities, such as fiber-optic cable. By offering these community anchor institutions connections with speeds that can approach 100 Mbps, plus expansion capacity, the federal government will bring communities nationwide into the larger national and international digital environment.

The benefits of such a strategy will be direct, tangible, rapid and profound. Regardless of their location, children and adult learners will be able to use anchor facilities to engage in distance learning. Medical professionals and their patients in under-served and unserved areas will be able to plug into the latest telemedicine capabilities. The indirect benefits will also be substantial and widely distributed. Once high-capacity and future-proof facilities are deployed to every community and embedded more deeply into those communities, the pump will be primed. Commercial and, where appropriate, non-commercial entities will have jumping off points for distributing broadband capability to Main Street and into neighborhoods. See, e.g., Consolidated Comments of Microsoft Corporation, FCC GN Docket No. 09-40 & DoC Docket No. 090309298-9299-01 (13 April 2009).

anchor institutions were to maintain open interconnection points, local network providers -- whether incumbent or new entrants -- could access those interconnections and use them as jumping off points for delivering last-mile service to Main Street and into neighborhoods. As explained more fully in our stimulus-related comments, the cost of last-mile connectivity is not the major obstacle to broadband deployment in much of rural America. The economics of that business are well-known and are regularly improving as a result of constant improvements in existing technology, as well as significant jumps in newer technology such as mobile broadband. The rural challenge is the cost and/or capacity constraints in getting from the town to the Internet backbone. We believe this central challenge can be overcome by bringing Baseline Broadband to anchor institutions and, then, by allowing local network operators to leverage those pipes for the further distribution of broadband to consumers.

c. Evolving the definition of Baseline Broadband

While it ought to go without saying, both the consumer and the anchor-institution definitions of Baseline Broadband should be updated periodically as applications, services and expectations evolve. Many of today's data and video-intensive applications are non-functional at the Commission's 256 kbps definition of "high speed" access. As the nation migrates into an environment in which Baseline Broadband capabilities are ubiquitous, those who receive subsidized Baseline capacity should not be at risk of seeing their connectivity, relatively speaking, fade from something meaningful to something effectively non-functional.

III. Subsidy programs need to be holistically reformed and refocused on Baseline Broadband

Of course, one cannot have effective access to broadband where the price is out of reach. To assure Baseline Broadband is affordable across the country – in both underserved and unserved communities – the nation's various subsidy programs have to be reformed holistically.

a. Create a "comprehensive ubiquitous access fund"

Starting with the end goal in mind, we believe that the FCC and the states should deliberately march towards eliminating stove-pipe programs that support different aspects of promoting, primarily, voice connectivity. Today, we have federal and state universal service charges, a variety of charges for accessibility programs and charges for e911 programs. These programs often are replicated at the state, county or city level. On a typical residential phone bill, these charges themselves can amount to $10 per month. And the carrier then assesses an additional 9 percent fee for administering the different programs. Just looking at the administrative costs, the 9 percent surcharge roughly amounts to $2 billion per year in overhead that society pays to maintain the multi-jurisdictional, complicated system. If the IRS operated that inefficiently, its annual budget would balloon by 2,000 percent. Federal taxpayers cover 44 cents in IRS overhead for every $100 collected. There is no reason why connectivity subscribers should continue to pay $9 for every $100 collected. All those who pay into and manage subsidy programs will be much better served by a unified, comprehensive approach.

With respect to beneficiaries, the comprehensive fund of course ought to continue to meet existing needs. For instance, programs to underwrite the purchase and use of assistive technology should be put under the comprehensive umbrella. But for the 21st century, the comprehensive fund also ought to support ongoing investment in: deployment and subsidization of Baseline Broadband; broadband adoption programs; and systems that assure community anchor institutions keep up with technological trends. In high-cost areas, the price of Baseline Broadband should be subsidized to assure the price to

the consumer approximates the end-user prices paid in suburban markets. Funds should be made available so that those in poorer communities can subscribe to Baseline Broadband at a needs-based discount from the market price.

b. Simplify fee collection by creating a connection and bandwidth based methodology

The locus of fee collection ought to be greatly simplified as well, and in particular, the new program ought to home in on a connections and bandwidth-based methodology. With the world of applications and services diversifying, and the differences between voice and other voice-enable applications blurring, there is little point in trying to hem them in for tax purposes. Creating legal boundaries around IP-enabled applications and services is inherently artificial, and with convergence intensifying, the incongruence between what the law can define and what the marketplace develops will become only starker. On the flip side, all users require a connection to a network from a provider of access services, and network providers offer those connections based on different levels of speed and quality of service. The existence of a connection, available at an offered speed, is an easily identified, universally consumed entity. By focusing fee and taxation questions on connections and bandwidth subscriptions, the Commission will further minimize confusion and waste.

For equity's sake, we also believe the consolidated, ubiquitous access fee should be assessed based on increments of bandwidth consumption. A voice-line subscriber – whether wireline or wireless -- should pay less than a Baseline Broadband subscriber, who should pay less than consumers of premium broadband capacity. In addition, the tax rate should be a percentage of the level of service acquired (irrespective of whether the user subscribes to voice, Baseline or premium broadband), not a fixed-dollar charge (which today is the standard approach). The fixed fees that are applied across the board today (e.g., Subscriber Line Charges) are inherently regressive, with those subscribing to the lowest tier services paying as much as consumers who purchase more expensive services.

c. Maximally rely on competitive forces

To avoid uncontrollable growth in the costs of universal service programs, the Commission and the states should maximally rely on competitive forces. Here, we see two important tactics, and to the extent these tactics require new legislation, federal and state regulators should seek those reforms.

First, to stimulate competition in high-cost areas (or rather to approximate it), we recommend conducting Dutch auctions for the right to receive subsidy flows. The benefits of Dutch auctions have been widely documented.[3] The basic concept is that multiple parties should be allowed to bid down, not up, price. The concept is suitable in high-cost geographies where the national interest lies in subsidy minimization and, as a corollary, maximizing operator efficiency. The most efficient operator – the one who is willing to take the lowest subsidy out of the consolidated pot of money for serving a particular market – would be awarded that level of subsidy for a period of years. To assure continued downward pressure on cost, the right to the subsidy stream would be re-bid after a succeeding, quantum improvement in technological efficiency and capability. This approach eliminates the fiscal risks that run with open-entry for subsidies. As the Commission saw when it allowed claims for USF subsidization in overlapping service territories (i.e., between incumbent wireline and new wireless services), overlapping subsidy streams rapidly increase subsidy costs.

[3] See, e.g., Wallsten, Scott, "Reverse Auctions and Universal Telecommunications Service: Lessons from Global Experience," 61 Fed. Comm. Law J. 373 (April 2008).

In addition, we believe that over the long haul supporting ubiquitous access should become a deflationary undertaking, not an inflationary one. Technological and business-model innovations have transformed the communications marketplace into a declining cost industry. Across the ecosystem, the business objective is to offer more capability along a Moore's Law trajectory; i.e., the cost of adding capacity rides a downward trend. For instance, we can expect that near-term improvements in radio technology will dramatically improve the price-performance ratio of wireless broadband technology. If providers of those offers could leverage the anchor-institution Baseline Broadband facilities mentioned above, they should be able to dramatically improve the distribution of broadband in rural America at ever-more affordable prices.

d. Continually improve cross-agency coordination

Finally, the country's stakeholder-agencies need to vastly improve their cross-organizational coordination. Other nations have outpaced the United States in deploying super-high speed connections by taking a centralized approach. The realities of the U.S. – with its multiple federal stakeholders, its layers of state and local regulators and its primary reliance on market forces – makes such a centralized approach impossible.

That said, there remain ample opportunities for governments and agencies at multiple levels to coordinate better among themselves and to synchronize programs in order to make faster progress towards national goals. At the federal level, there should be institutional, programmatic coordination across the FCC, NTIA and RUS to assure that broadband subsidy programs (either in the form of grants, loans or subsidies for operating expenses) are mutually reinforcing; are focused on the most pressing needs of the unserved and underserved; and over time, aim to constrain or, better, reduce the need for subsidies. Demand generation programs and e-literacy programs across DOL, the Education Department, NTIA and the FCC need to be coordinated. Federal agencies providing funds or benefits to anchor institutions must coordinate; e.g., FCC, NTIA, Homeland Security, HHS and Education. Finally, with respect to states and localities, the nation needs federal leadership to harmonize tax and subsidy systems in order to squeeze out inefficiencies and uproot systems that deter deployment of innovative applications and services.

IV. The FCC should programmatically look for opportunities to improve spectrum efficiency

In addition to revamping the nation's subsidy programs, the Commission can accelerate access to affordable broadband by programmatically reviewing its radio rules, spectrum allocations and spectrum-sharing efforts with an eye towards increasing spectrum usage and efficiency.

As an initial step, the Commission should assess whether existing allocations are being fully utilized. The multi-year debate in the white spaces proceeding, while laborious, stemmed from the observation that radio allocations made 50 years ago were leaving vast swaths of highly useful spectrum completely untapped. This is tantamount to resource wastage. A non-polluting, society-enhancing, government controlled resource was sitting – not underutilized – but completely unused in many, many parts of the country. Even after the Digital TV transition, 50 over-the-air broadcast channels will be allocated in economically struggling small towns like Lusk, Wyoming (population 1,400), on Native American lands in remote parts of Arizona and in low-income neighborhoods in large cities like Houston, Texas. Those communities are unlikely to ever economically support 50 over-the-air stations (or even a third that number); yet until the white spaces decision, the fallow spectrum could not be used for new, society-enhancing purposes like extending Internet access wirelessly. The decision in the white spaces

proceeding shows that advances in technology can squeeze out inefficiencies in decades-old allocations. We believe there is more valuable spectrum going unused, but to find it the Commission must begin looking at actual usage.

Spectrum reserved for the federal government use could be a rich field to explore in this regard. And here, there is an additional element to consider. Unlike private sector users, federal licensees lack market-oriented incentives to increase their spectrum efficiency. The profit motive creates incentives for the private sector to continually look for ways to derive more commercial value from their spectrum assignments. For obvious and legitimate reasons, federal licensees have different motives (e.g., emergency preparedness, national defense). Moreover, federal licensees are beholden to the government's budget constraints when it comes to technology acquisition. As a result, we believe it is the rare case when a federal licensee has both the motive and the financial ability to constantly upgrade its radio technology. More likely, in the typical case federal systems are inefficient by modern standards. To get to the bottom of this question, the Commission will need to actively engage the NTIA and, likely, Congress. We believe such an investment will bear substantial fruit.

We stress the importance of digging deep to unearth opportunity, because we see a paradigm shift also underway in radio operations. Software-defined radios (that can adaptively change their air-interfaces so as to emulate different hardwired radios) and gap-filling operations like those contemplated in the white spaces Order are making their way into to the mainstream. For the full benefits of this technological shift to become reality, the Commission will need to constantly look for and eliminate regulatory impediments.

As it does, we encourage the Commission to accommodate the super-smart agile radios both in spectrum to be licensed and in spectrum that can be used on an unlicensed basis. Already, we have seen many societal benefits flow from Wi-Fi and Bluetooth devices, and we anticipate more "super Wi-Fi" capabilities emerging in the white spaces. The unlicensed model allows for tremendous exploration and innovation, and such innovations can be exploited at the personal, local and wide-area levels. Since ever-smarter radio technology will make spectrum-sharing more feasible with time, the Commission should continue to generate spectrum opportunities for new licensed and unlicensed devices.

Finally, the Commission should recognize that both large and small U.S. companies are at the forefront of this technological change. To be successful in today's marketplace, however, technology companies need access to the global market. To produce sophisticated devices at low, consumer friendly prices requires scale, and that scale only exists in a global marketplace. It is essential, then, to constantly review and change U.S. policies that might impede the worldwide rollout of efficiency-enhancing products and practices. To increase the odds that those policy changes will produce results, the Commission also will have to engage the international community and educate it on the benefits of such reforms. Key initiatives here are harmonizing spectrum allocations and reducing trade barriers that often are masked as standards-mandates or other means of shielding incumbents from protection.

V. The Commission should establish a convergence-aware policymaking framework

We see two additional policy ramifications of convergence, and the complex and uncharted new business pressures that convergence brings along with it. First, there is a need to move away from today's silos, and not just with respect to defining Baseline Broadband and in reforming subsidy programs. With consumers freely traversing the wireline and wireless boundary, the regulatory boundary between the two invites a complete rethinking. Second, given the extraordinarily rapid and

wholly unpredictable evolution of services and applications, we see the need for policymaking principles centered on supporting innovation and protecting consumer interests in an agile, rather than prescriptive, way. We share our thoughts on new principles for policymaking in the communications realm in hopes of initiating a community-wide discussion.

a. Eliminating silos

While we have mentioned several times consumers' desire to traverse device boundaries, it is worth stepping back and taking a broader look at what is happening in the marketplace. The very rapid adoption of the Apple iPod, iPhone and Apple's Application Store is just one indication of consumer demand for seamless experiences. The rest of the industry is moving towards the same model. At Microsoft, we highlight "integrated innovation" as one of our key customer value propositions. This now goes beyond assuring thousands of applications and devices can run on a Windows-based PC. It means that we work on creating technology that allows users and application developers to enjoy similar experiences regardless of the form factor – whether it is a low-cost PC, a Windows Mobile smartphone or, for entertainment purposes, an XBOX or a Zune. Now, we are working on an application-development platform in the cloud – Azure. The Azure-driven cloud will work hand-in-glove with smart devices and, we anticipate, will make the user-centric computing model a global phenomenon. When Google first launched its Android operating system, it was billed primarily as a means for driving smartphone sales, but within the last year it has migrated onto low-cost PCs. And supporters of the Linux operating system continue to look for ways to bring that platform out of the back-office and onto phones and personal computers. For the seamless end-user benefits to flow from these innovations, the information technology will have to interoperate in multiple directions between the user experience, the screen, the larger device and the underlying transport just to name a few.

In this context, it is important that the regulatory structure not get in the way of the companies creating, and the individuals enjoying, these valuable applications. More to the point, for these services and applications to operate seamlessly across different types of networks – from wireline to wireless -- the regulatory structure governing transport should be as seamless as possible. We therefore encourage the Commission to evolve its policymaking process towards a new framework that is agnostic about the means by which packets are transported.

b. The framework should be agile, recognizing the fact that the emerging ecosystem is complex

While we argue for the end of silos, like others who have commented on the future of communications regulation, we certainly do not urge that rules in every individual silo be applied to all the others in an effort to assure pan-industry regulatory parity. Such an effort would be doomed due to the contradictions that would ensue when rules from different silos are conjoined. More importantly, the transformation of a collection of once-distinct, now-changing, industry silos into a converged *complex, adaptive system* with nonlinearities, complex feedback loops and often unpredictable emergent behaviors means that regulation should shift its center of gravity from micro-managing via detailed rules to guiding behavior using principles. We believe that principles-based policymaking will enable officials to create a legal regime that lowers risk of adverse outcomes in the presence of complexity and uncertainty, and that will allow officials to act more quickly to address unanticipated adverse phenomena.

A regulatory regime, like other man-made systems of governance, is a social technology.[4] Consequently, "regulatory technology" ought to evolve like any other technology. We believe policymaking and regulation in today's environment can be most effective if it recognizes that many aspects of a complex adaptive system cannot be anticipated and thus "managed," and that most often policymakers can only react when they see the undesirable behaviors. In other words, it is not possible to create detailed rules that anticipate every contingency.

That said, we do believe that with deliberate, thoughtful effort the FCC can create an agile policymaking framework. Research and experience from the world of adaptive and complex systems, where such environments have been studied and managed, can offer principles to guide this type of policymaking. The meta-principles include:

- **Big Picture**. Policymakers should take a broad view of the problem and solution space. Recognize that interaction occurs at many different scales, from packet flows to social networks. Therefore, prefer generic to sector-, technology-, or business-specific policies.

- **Diversity**. Recognize that multiple solutions are possible. Rules should enable multiple solutions. Promote diversity and do not entrench one solution through regulatory preference.

- **Flexibility.** Determine ends, not means. Describe and justify the outcomes sought, not the methods to be used to achieve them. When prescribing rules, prefer *ex post* to *ex ante* regulation. Consider glide paths for new entrants to meet policy objectives. Regularly review the need for ongoing regulation (e.g., by sun-setting regulations unless re-justified).

- **Transparency.** Encourage transparency in regulatory and market processes. Create incentives for stakeholder involvement in policy development, execution and enforcement. Enable the shaping and monitoring of market activity by consumers, civil society and industry participants – i.e., those close to the action.[5]

We believe policymaking guidelines like these can help safeguard innovation and establish resilient norms in the face of fast-changing circumstances regardless of the industrial sector. In the communications and Internet realm, these guidelines should help address the regulatory quandaries faced by the Commission and other stakeholders. These high-level guidelines can assist policymakers in identifying and promoting the ends they would like to achieve without requiring soon-to-be-outdated – and potentially innovation impeding – articulation of the means. We look forward to a discussion in the community about the adequacy of and how to refine these principles.

[4] See Beinhocker, Eric D., *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics* (Harvard Business School Press, 2006) (discussing at length the distinction between physical and social technology).

[5] See De Vries, Pierre J., "Internet Governance as Forestry: Deriving Policy Principles from Managed Complex Adaptive Systems," (April 2008) (available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1229482).

Conclusion

The NOI seeks input on a wide range of important policy questions. As the Commission develops its Broadband Plan, it will be important to establish priorities. This document provides our views on the handful of strategies we feel are most important to achieving our shared goals. We look forward to an ongoing dialogue with the Commission and other participants in shaping the final contours of the Plan.

Respectfully submitted,

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